

CLAIMS

What is claimed is:

1. A solder composition comprising:
a mixture of elements comprising tin (Sn) and silver (Ag); and
5 a granular additive which is at least about 3% of the solder composition by weight, the granular additive comprising a nickel iron alloy comprising about 36% nickel (Ni) and about 64% iron (Fe) , by weight.
2. The solder composition of Claim 1 in which the granular additive is pretreated with flux.
- 10 3. The solder composition of Claim 2 in which the flux comprises zinc chloride, ammonium chloride and hydrochloric acid.
4. The solder composition of Claim 1 in which the mixture of elements comprises by weight about 95% - 97% tin (Sn) and about 5% - 3% silver (Ag).
5. The solder composition of Claim 1 in which the mixture of elements further
15 comprises bismuth (Bi).
6. The solder composition of Claim 5 in which the mixture of elements comprises by weight about 61% - 39% tin (Sb), about 59% - 37% bismuth (Bi), and about 1% - 3% silver (Ag).
7. The solder composition of Claim 1 in which the granular additive is about 30%
20 of the solder composition by weight.

8. The solder composition of Claim 7, in which the mixture of elements comprises by weight about 95% tin (Sn), and about 5% silver (Ag).
- 5 9. The solder composition of Claim 7 in which the mixture of elements comprises by weight about 75% tin (Sn), about 23% bismuth (Bi) and about 2% silver (Ag).
10. The solder composition of Claim 1 in which the granular additive is about 20% of the solder composition by weight.
- 10 11. The solder composition of Claim 10 in which the mixture of elements comprises by weight about 62% tin (Sn), about 36% bismuth (Bi) and about 2% silver (Ag).
12. The solder composition of Claim 10 in which the mixture of elements comprises by weight about 72% tin (Sn), about 26% bismuth (Bi) and about 2% silver (Ag).
- 15 13. The solder composition of Claim 10 in which the mixture of elements comprises by weight about 78% tin (Sn), about 20% bismuth (Bi) and about 2% silver (Ag).
14. The solder composition of Claim 10 in which the mixture of elements comprises by weight about 83% tin (Sn), about 15% bismuth (Bi) and about 2% silver (Ag).
- 20 15. The solder composition of Claim 10 in which the mixture of elements comprises by weight about 88% tin (Sn), about 10% bismuth (Bi) and about 2% silver (Ag).

16. A solder composition comprising:
a mixture of elements comprising tin and silver; and
a granular additive comprising a material having a low coefficient of thermal expansion and being at least about 3% of the solder composition by weight.
17. The solder composition of Claim 16 in which the granular additive comprises iron.
18. The solder composition of Claim 16 in which the granular additive comprises iron and nickel.
19. The solder composition of Claim 16 in which the granular additive is pretreated with flux.
20. The solder composition of Claim 19 in which the flux comprises zinc chloride, ammonium chloride and hydrochloric acid.
21. A method of forming a solder composition comprising:
forming a molten mixture of elements comprising tin and silver; and
adding a granular additive to the molten mixture of elements, the granular additive being at least about 3% of the solder composition by weight, the granular additive comprising a nickel iron alloy comprising about 36% nickel (Ni) and about 64% iron (Fe), by weight.
22. The method of Claim 21 further comprising pretreating the granular additive with flux before adding the granular additive to the molten mixture of elements.

23. The method of Claim 22 further comprising pretreating the granular additive with flux comprising zinc chloride, ammonium chloride and hydrochloric acid.
24. The method of Claim 21 further comprising forming the molten mixture of elements to comprise by weight about 95% - 97% tin (Sn) and about 5% - 3% silver (Ag).
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25. The method of Claim 21 further comprising including bismuth in the molten mixture of elements.
26. The method of Claim 25 further comprising forming the molten mixture of elements to comprise by weight about 61% - 39% tin (Sn), about 59% - 37% bismuth (Bi), and about 1% - 3% silver (Ag).
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27. The method of Claim 21 further comprising adding an amount of the granular additive to comprise about 30% of the solder composition by weight.
28. The method of Claim 27 further comprising forming the molten mixture of elements to comprise by weight about 95% tin (Sn) and about 5% silver (Ag).
- 15 29. The method of Claim 27 further comprising forming the molten mixture of elements to comprise by weight about 75% tin (Sn), about 23% bismuth and about 2% silver.
30. The method of Claim 21 further comprising adding an amount of the granular additive to comprise about 20% of the solder composition by weight.

31. The method of Claim 30 further comprising forming the molten mixture of elements to comprise by weight about 62% tin (Sn), about 36% bismuth (Bi) and about 2% silver (Ag).
- 5 32. The method of Claim 30 further comprising forming the molten mixture of elements to comprise by weight about 72% tin (Sn), about 26% bismuth (Bi) and about 2% silver (Ag).
33. The method of Claim 30 further comprising forming the molten mixture of elements to comprise by weight about 78% tin (Sn), about 20% bismuth (Bi) and about 2% silver (Ag).
- 10 34. The method of Claim 30 further comprising forming the molten mixture of elements to comprise by weight about 83% tin (Sn), about 15% bismuth (Bi) and about 2% silver (Ag).
35. The method of Claim 30 further comprising forming the molten mixture of elements to comprise by weight about 88% tin (Sn), about 10% bismuth (Bi) and
15 about 2% silver (Ag).
36. A method of forming a solder composition comprising:
forming a molten mixture of elements comprising tin and silver; and
adding a granular additive to the molten mixture of elements, the
granular additive comprising a material with a low coefficient of thermal
20 expansion and being at least about 3% of the solder composition by weight.
37. The method of Claim 36 further comprising adding a granular additive comprising iron.

38. The method of Claim 36 further comprising adding a granular additive comprising iron and nickel.
39. The method of Claim 36 further comprising pretreating the granular additive with flux before adding the granular additive to the melting mixture of elements.
- 5 40. The method of Claim 39 further comprising pretreating the granular additive with flux comprising zinc chloride, ammonium chloride and hydrochloric acid.